FACT SHEET FOR STATE WASTE DISCHARGE PERMIT ST 6064

STARKEL POULTRY, INC.

3/10/2005

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INTRODUCTION

This fact sheet is a companion document to the draft State Waste Discharge Permit No. ST 6064. The Department of Ecology (Department) is proposing to issue this permit, which will allow discharge of wastewater to waters of the state of Washington. This fact sheet explains the nature of the proposed discharge, the Department's decisions on limiting the pollutants in the wastewater, and the regulatory and technical bases for those decisions.

Washington State law [Revised Code of Washington (RCW) 90.48.080 and 90.48.162] requires that a permit be issued before discharge of wastewater to waters of the state is allowed. Regulations adopted by the state include procedures for issuing permits [Chapter 173-216 Washington Administrative Code (WAC)], and water quality criteria for ground waters (Chapter 173-200 WAC). They also establish requirements which are to be included in the permit.

This fact sheet and draft permit are available for review by interested persons as described in Appendix A--Public Involvement Information.

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in these reviews have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Changes to the permit will be addressed in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	Starkel Poultry, Inc.
Facility Location	10524 128th Street East Puyallup, WA 98374
Facility Mailing Address	P.O. Box 73340 Puyallup, WA 98373-0340
Approximate Land Application Location	3518 208th Street East Spanaway, WA 98387
Contact at Facility	Ms. Susan Starkel Telephone #: (253) 845-2876
Type of Facility	Poultry processing (SIC 2015)
Type of Treatment	Screening and aeration followed by land application
Legal Description of Application Area	Section 17, Township 18N, Range 4E NW ¼, NE ¼ Latitude: 47º 18' xx" N. Longitude: 122º 22' xx" W.

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

HISTORY

Starkel Poultry, Inc. slaughters poultry and processes the chicken meat for distribution and retail sales. Starkel Poultry, Inc. first submitted a permit application on September 30, 1992, and was granted a temporary permit on November 30, 1992. The facility has been covered under a State Waste Discharge Permit ever since. The facility land applies its industrial process wastewater on approximately 113 acres of farmland located approximately 10 miles south east of the facility. The facility is located in Puyallup, Washington and the farmland is located in Spanaway, Washington. Figures 1 and 2 provide maps showing the location of the facility and the farmland. The Start and End indicators in Figures 1 and 2 designate the facility and the farmland, respectively.

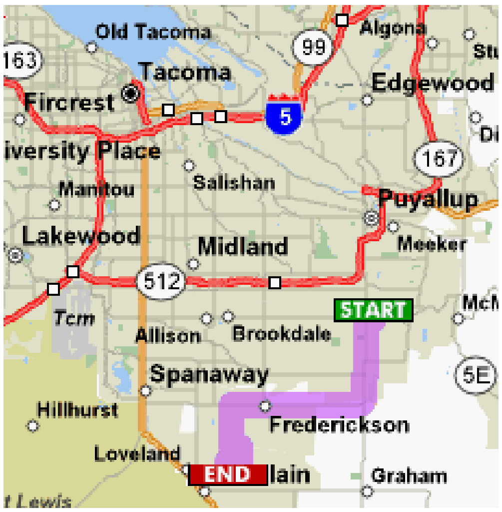

Figure 1. Vicinity Map.

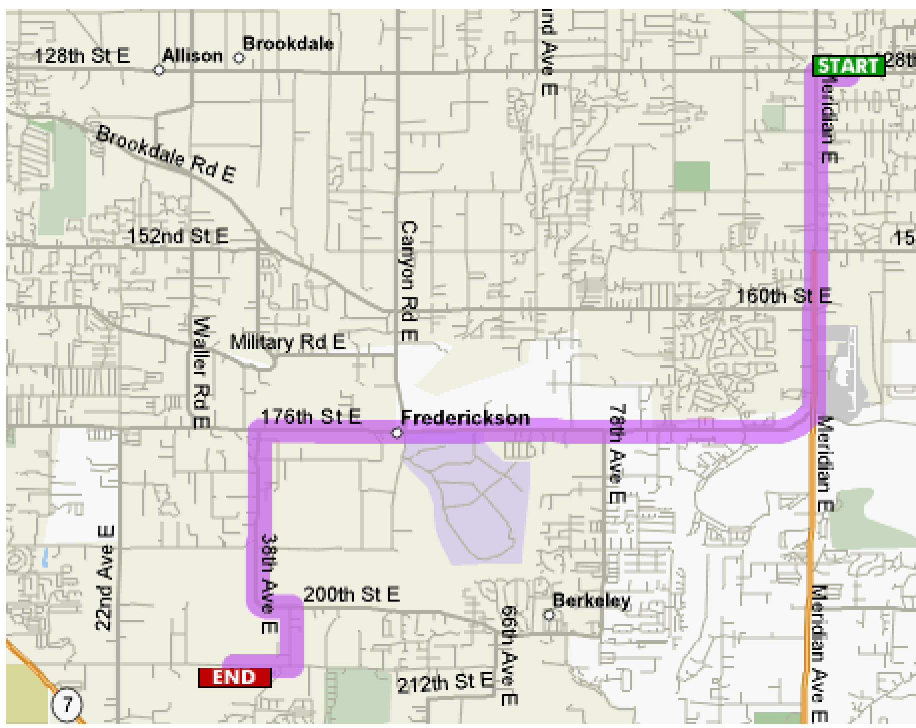

Figure 2. Detailed Map.

INDUSTRIAL PROCESSES

An average of 21,000 chickens are processed each day at Starkel Poultry, Inc. live chickens are unloaded at the receiving area and suspended from a conveyor belt for slaughtering. Once the chickens are slaughtered, they are conveyed to another area where blood is collected and hauled out by a contractor. The next step is to dip the chickens in scalding hot water for de-feathering. The feathers are collected and combined with manure, pressed for de-watering and sold to local farmers. Any residual feathers or hairs on the chickens are singed off by flame. The chickens are then washed and eviscerated and thoroughly washed again. The final process is chilling and packaging of poultry and shipping the meat to customers.

The water consumption is primarily in washing of carcasses during the various stages of processing the chickens. Other water consumption uses include: floor washing, ice production and cooling of vacuum pumps. An estimated average water consumption is 2-2.5 gallons per chicken. This equates to an average of 42,000 to 52,500 gallons per day of water consumption. This water consumption occurs over approximately 35 weeks per calendar year. Ice production comprises approximately one-fourth of the total water consumed. Forty (40) tons of ice are produced at the facility each day. One ton of ice is approximately equivalent to 240 gallons of water. Approximately half of the ice produced leaves the facility with the product.

TREATMENT PROCESSES

All process wastewater generated in the facility is drained by gravity to a central 200 gallon transfer tank. The water is then pumped into a stationary hydrosieve for filtration of solid matter. A vibrating screen previously used has been replaced with the current static screen. Once filtered, the wastewater flows by gravity to a gunite-lined concrete transfer pond. The pond can be used to hold up to five days of wastewater, if necessary, during bad weather, truck breakdown, or other emergencies.

Under normal conditions, no more than 10,000 gallons is held in the transfer pond. This helps to keep odors down. The pond bottom has a concrete lining of 1.5 feet and the embankments have a lining of approximately 6 inches of concrete. The pond has a water-cooled submerged pump in the middle that continuously circulates the water to prevent anaerobic conditions and to prevent residues from settling on the bottom. The pond is drained on an hourly basis into 6,500-gallon tanker-trucks via gravity and two manually operated valves. One of the valves is in a locked shed with a time recorder. The driver of the tanker consistently records his trips by clocking in his time for every load he/she picks up. This is used to estimate the volume of wastewater carried to the land application site. The tanker-trucks carry the wastewater to the “ranch” for land application. At the end of the day, approximately 500 gallons of wastewater are left in the pond to protect the pump. The concrete pond is cleaned quarterly and examined for cracks and other damage. Appropriate corrective actions are taken immediately if any damage is found.

DISTRIBUTION SYSTEM (SPRAYFIELD)

At the “ranch,” the tanker-trucks empty the chicken processing wastewater to an underground concrete tank (20,000 gallons). The concrete walls of the tank are at least 8-inches thick. The tank is surrounded by concrete pads that slope towards the tank. The tank is inspected quarterly per year.

The tank is emptied by a 25-HP irrigation pump, which is automatically activated by a float in the tank. This leaves only 500 gallons remaining in the tank when the pump shuts off. The tank also contains a re-circulating pump, which helps to reduce the chance of residue settling on the bottom.

The water is pumped through a 6-inch main line that crosses the main 60 acres and then crosses the 13 acres north of 208th Street and finishes on the 40 acres northeast of the main 60 acres. High lying fields are used during winter months and low-lying lands are used during drier months. Field distribution is accomplished by hand line or wheel line based on field characteristics. The tank driver, and the ranch hand monitor the pipe systems on a constant basis to alleviate leaks and breaks.

Irrigation of the grassy land is carried out on a year-round basis. However, during icy conditions, no wastewater is land applied. Chicken processing is shut down under icy conditions so no wastewater is generated.

Irrigation of the land with wastewater is done on a rotating basis. Approximately 4 to 5 acres are irrigated on a daily basis during summer and some 20 acres per day are irrigated during winter. Different parcels of land are irrigated every day. The land is irrigated twice per day, once in the morning and once in the evening. A logbook is maintained which records which field is being irrigated on which day and the volume of wastewater being land applied.

The facility appears to have adequate land to apply at agronomic rates. Regardless, there must be some assurances that excessive wastewater pollutants will not be land applied. One way to assure this is through ground water quality monitoring and through the use of developing and following Annual Crop and Irrigation Management Plans.

GROUND WATER

The land application site has both shallow and deep wells. A 96-feet deep well (a production well) is located near the lowest point in the field and a 180-feet deep well (domestic well) is located at "the ranch." The 180-feet deep well was monitored by a contract laboratory. The data collected is shown in Table 1.

Table 1. Groundwater Characterization in the Deep Aquifer

Parameter	Concentration
Salmonella	Negative (qualitative)
Fecal Coliform	<2.2 MPN/100 mL
Nitrate-N	3.6 mg/L
Ammonia-N	0.82 mg/L

The 96-feet deep well was constructed approximately in 1987. The 180-feet deep well is even older. These wells were not designed to assess an activity's impact on groundwater quality. The two wells are completed at different depths and are well below the water table. Nitrate and other inorganic chemicals typically reside in the uppermost zone of the aquifer. Therefore, these wells may not provide data, which is indicative of true impacts to groundwater quality. Monitoring wells located in the uppermost aquifer are necessary to properly evaluate groundwater quality. This is dependent upon the geology of the site, the loading at the application site, and the water quality data collected from the existing wells. The water quality data from the existing wells were not monitored frequently or consistently enough to draw conclusions. This, coupled with the problems of well construction, make it difficult to determine whether past activities have impacted groundwater quality.

Since this determination has been made, 11 piezometers have been installed as part of the recommendations of the report titled: Soil Profile Analysis and Piezometer Installation. The report was prepared in response to the Department's request for information on existing boreholes to determine if they can be used for groundwater monitoring. The report uses the term piezometer and monitoring well interchangeably to describe these boreholes. Piezometers are typically designed to monitor water level elevations and are not designed to collect groundwater samples. Piezometer tubes are susceptible to contamination and would provide samples that are not representative of the groundwater sampled. The previous permit's Fact Sheet stated, "if these are intended to be used as monitoring wells to monitor groundwater quality, then they should be completed according to Chapter 173-160 WAC (Minimum

Standards for the Construction and Maintenance of Wells). This includes constructing a permanent surface seal, securing the open hole with a locking cap, and providing protection from animals and heavy equipment."

Of the 11 piezometers which were installed at "the ranch," only four of these piezometers have been selected to monitor background and downstream groundwater quality. Unfortunately, neither the Department nor the previous permit was clear regarding the need to upgrade the four piezometers so that they conform to Chapter 173-160 WAC as groundwater monitoring wells. The Department also did not follow-up with the Permittee regarding the correction of these issues.

The Department recently conducted a review of the groundwater monitoring network at "the ranch" and this issue has come to the Department's attention again. Several Technical Assistance visits and inspections have been made in 2004 to help inform the Permittee regarding this issue and how the problem may be corrected. The recommended corrective action was to require the Permittee to replace or retrofit six of the existing piezometers to convert them into groundwater monitoring wells as part of this permit's conditions. The Department is also requiring the construction of two new groundwater monitoring wells at new locations which will result in a new groundwater monitoring network consisting of a total of 8 groundwater monitoring wells.

Table 2 (shown on the next page) provides a summary of the average groundwater quality that was collected as part of the groundwater monitoring program established in the previous permit. The data is from discharge monitoring reports (DMRs) submitted from January 1998 through January 2004. MW1 and MW8 were considered upgradient wells and MW7 and MW9 were considered downgradient wells.

It should be noted that since the existing groundwater monitoring data collected by using piezometers, the data is most likely subject to contamination and is not representative of the groundwater sampled. Table 2's summary of the groundwater data is intended to provide a general idea of the groundwater quality and provides the worst-case depiction of what can be expected after the piezometers are all replaced by groundwater monitoring wells. It should also be noted that these values can not be compared readily to the groundwater quality standards without acknowledging that this data represents very shallow groundwater zones. The groundwater that ultimately reaches the lower aquifers will have been essentially filtered and processed further by microbial activity in the soil.

Table 2 indicates that there are three parameters that need to be monitored closely in the future: pH, total coliform, and total iron. It is highly likely that natural background groundwater conditions are the cause of the low pH and high iron concentrations measured. Additional, more reliable data will allow a baseline determination of what the natural background groundwater condition may be. The total coliform concentrations are unusually high and the Department believes the cause of these high concentrations to be attributed to direct contamination of the piezometers from spraying of wastewater, influences from resident critters such as rodents, snakes, birds, etc. Once the piezometers are replaced with groundwater monitoring wells, more reliable total coliform values are anticipated.

Table 2. Groundwater Characterization in Shallow Aquifer.

Parameter	MW1 Average	MW7 Average	MW8 Average	MW9 Average
Water Depth (ft)	1.6	1.9	2.3	2.3
pH (s.u.)	6.4	7.1	6.5	6.5
Conductivity (µmho/cm)	78	181	224	153
TKN (as N) (mg/L)	3.5	1.5	1.4	1.9

Parameter	MW1 Average	MW7 Average	MW8 Average	MW9 Average
NO_3/NO_2 (as N) (mg/L	0.2	5.8	5.5	4.8
NH_3 (as N) (mg/L)	0.3	0.1	0.1	0.1
TDS (mg/L)	55	133	204	171
Chlorides (mg/L)	4	11	19	15
Total Coliform (cfu/100 mL) [1]	551	724	1,291	2,070
Total Iron (mg/L)	4,927	4,836	4,568	2,202

[1]Total Coliform is provided as the geomean value of the data.

It should also be noted that the southeastern portions of field numbers 6 and 8 lie outside of the Vashon Till area and are Recessional Outwash Deposits. The outwash deposits are very permeable and it is possible (but unlikely) that during certain times of the year (when the aquifer is low) the wastewater being applied to ground in that area would cause an exceedance to the groundwater quality standards. This is unlikely because the facility is land applying far below the agronomic rate. However, well numbers 6 and 8 will be monitored closely for any changes in groundwater quality. The Department reserves the right to make more stringent land application requirements in the future if this is determined to cause problems in the future.

PERMIT STATUS

The previous permit for this facility was issued on June 8, 1999 and modified on May 5, 2000.

An application for permit renewal was submitted to the Department on November 26, 2002, and revised submittal on February 6, 2003, and was accepted by the Department on February 18, 2003.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility last received a groundwater sampling inspection on June 8, 2004.

During the history of the previous permit, the Permittee has remained in compliance based on Discharge Monitoring Reports (DMRs) and other reports submitted to the Department and inspections conducted by the Department. The Department has been working with the Permittee to develop in more detail and, rely upon more completely, the Annual Crop and Irrigation Management Plans for use as a management tool to ensure that agronomic rates are determined and can be followed. The Department has encouraged the Permittee to place more emphasis upon these Plans and, so far, the Permittee has been responding positively.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the permit application and in discharge monitoring reports. The proposed wastewater discharge prior to land application is characterized for the following parameters provided in Table 3. The data is from discharge monitoring reports submitted to the Department from January 1998 through January 2004.

Table 3: Pond Effluent Characterization

Parameter	Average
Flow, gallons per quarter	2,533,987
BOD_5, mg/L	3,050
TSS, mg/L	1,002
pH, s.u.	6.5
TKN-as N, mg/L	207
NO_3/NO_2-as N, mg/L	0.21
NH_3-as N, mg/L	14.6
Fats, oils grease, mg/L	655
TDS, mg/L	1,002
Chlorides, mg/L	94
Total Coliforms, cfu/100 mL	15,499 [1]

[1]Total Coliform is the geometric mean value of the data.

SEPA COMPLIANCE

There are no known State Environmental Policy Act (SEPA) compliance issues associated with this facility's industrial process wastewater discharge to ground at this time.

PROPOSED PERMIT LIMITATIONS

State regulations require that limitations set forth in a waste discharge permit must be either technology- or water quality-based. Wastewater must be treated using all known, available, and reasonable treatment (AKART) and not pollute the waters of the state. The minimum requirements to demonstrate compliance with the AKART standard were determined in the engineering report (*Starkel Poultry, Inc. Design Report on Wastewater Treatment Processes and Disposal*, Parametrix, Inc., May 1986). This report was completed prior to the development of *Guidelines for the Preparation of Engineering Reports for Industrial Wastewater Land Application Systems*, May 1993. It is concluded however, that land application of poultry wastewater (after screening and temporary retention in the aerated pond) over sufficient area applied at agronomic rates would provide a reasonable "treatment" for removal of the pollutants present in the wastewater. The operation and maintenance manual should be updated according to the current practices of the facility.

The more stringent of the water quality-based or technology-based limits are applied to each of the parameters of concern. Each of these types of limits is described in more detail below.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

All waste discharge permits issued by the Department must specify conditions requiring available and reasonable methods of prevention, control, and treatment of discharges to waters of the state (WAC 173-216-110). As discussed earlier, wastewater generated at Starkel Poultry, Inc. is first screened to remove solids. This is followed by storage in a lined pond where a submerged pump recirculates the wastewater, thus providing aeration. Wastewater from the pond is loaded onto tanker trucks daily and taken approximately 10 miles southeast to the land application site for application at agronomic rates. This removal of solids followed by nutrient and organic uptake by vegetation and microbes at the land application site may be construed as AKART for this facility. Therefore, no technology-based effluent limitations would be imposed on the aerated pond effluent at this time since the vegetation in the land application site is being considered as part of the "treatment" so that the groundwater criteria is met below the land application site, i.e. at the groundwater table. This permit relies upon the Annual Crop and Irrigation Plan to establish yearly management plans to ensure land application is done below agronomic rates and groundwater quality standards can be met.

GROUND WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's ground waters including the protection of human health, WAC 173-200-100 states that waste discharge permits shall be conditioned in such a manner as to authorize only activities that will not cause violations of the Ground Water Quality Standards. Drinking water is the beneficial use generally requiring the highest quality of ground water. Providing protection to the level of drinking water standards will protect a great variety of existing and future beneficial uses.

Applicable ground water criteria as defined in Chapter 173-200 WAC and in RCW 90.48.520 for this discharge include the following:

Table 4: Ground Water Quality Criteria

Ground Water Parameter	**Concentration**
Total Coliform Bacteria	1 Colony/100 mL
Total Dissolved Solids	500 mg/L
Chloride	250 mg/L
Nitrate-as Nitrogen	10 mg/L
pH	6.5 to 8.5 standard units
Total Iron	0.3 mg/L
Toxics	No toxics in toxic amounts

The Department has reviewed existing records and is unable to determine if background ground water quality is either higher or lower than the criteria given in Chapter 173-200 WAC. The discharges authorized by this proposed permit are not expected to interfere with beneficial uses. Once background water quality has been established, enforcement limits will be established in groundwater. At this time, there is not enough groundwater quality data that the Department believes to be representative of the shallow groundwater conditions.

Hydraulic Assimilative Capacity of the Soil:

The maximum wastewater volume that can be applied at any given time is a difference between the site percolation plus evapotranspiration and precipitation. The Permittee will be required to develop a monthly hydraulic loading table for the whole year for all the land application sites. At the end of every permitting year, the hydraulic loading table will be modified, if necessary, based on past year's data.

Application rates must be optimized to prevent runoff and ponding. Runoff may lead to direct discharge of pollutants into the neighboring areas. Ponding can promote anaerobic conditions with undesirable odors. To prevent ponding or runoff, monthly application rates should never be greater than the difference between infiltration capacity of the soil plus evapotranspiration and precipitation. Thus a water balance approach should be used to determine the monthly hydraulic loading rates.

The rates of application as determined above should be reduced if infiltration rates are high or the soil holding capacity is low so that the soil retains the wastewater long enough for assimilation of organics and nutrients. The frequency of application within a given month should also be determined so that the soil crop system is allowed to reaerate before the next application.

On sites with high permeability, wastewaters may be applied at evapotranspiration rates, or at field capacity to maintain aerobic conditions as well as prevent rapid infiltration of the wastewater.

Rate of application is also important to maintain aerobic conditions and minimize BOD and ammonia discharge to the groundwater.

Assimilative Capacity of Soil for Fats and Oils:

Animal fats (triglycerides) are expected to be rapidly metabolized by soil microbes (Michael Overcash, 1979). It is estimated that 68 percent of fats and oils would be removed in seven days and 84 percent in 12 days when fats and oils are land applied at 0.5 percent of the weight of the soil. Microbes that degrade fats and oils comprise of psychrophilic, meophilic, and thermophilic types. However, the rates of metabolism increase with temperature. The mesophilic organisms (20-37°C) are assumed to degrade fats and oils most effectively. Excessive application of fats and oils can impact plant growth by suffocation or exclusion of air or oxygen due to increased microbial activity. Thus, crop yield may decrease with increasing loading of fats and oils. Application rates of 0.5 percent of soil weight does not significantly reduce crop yield.

The effluent has an oil and grease concentration of 655 mg/L (see Table 3). With a daily volume of 52,500 gallons applied to land, the monthly hydraulic loading is 1.05 million gallons. The total loading of oil and grease is thus calculated to be 5,740 pounds per month.

Using fats and oil degradation rate of 0.5 percent soil weight per month, the required area of application to the site can be calculated as follows:

Assuming a soil bulk density of 1.5 g/cm^3, the weight of the soil per acre for a 3-inch depth is 1.02 x 10^6 lb/acre-3-inch. The oil that can be applied per acre is thus (0.5 percent) x 1.02 x 10^6 or 5,100 lb per acre per month.

Thus the total acreage required for the monthly fats and oils loading is 5,740/5,100 = approximately 1.125 acres. The daily application should be on a minimum parcel size of 0.056 acres. No more application of fats and oils on this parcel would be allowed for a month. Also application should be over a larger area during temperatures cooler than 20°C.

If the fats and oils are applied in a 6-inch depth (e.g. with sub-surface irrigation), then the weight of soil used in microbial degradation would be 2.04 x 106 lb/acre-6-inch; and the fats and oil that can be applied per acre would be 10,200 lbs per acre per month. The total acres required per month would be 5,740/10,200 = approximately 0.56 acres.

It may be noted that actual rates of degradation may be higher or lower depending upon field conditions. It should also be noted that with the current field designations and sizes for land application, there is unlikely to be a problem with assimilation of fats and oils if the fields are managed and rotated appropriately.

Assimilative Capacity of Soil for Oxygen Demand:

Although BOD_5 is not part of the groundwater quality standards, it has an important role in the successful operation of a land application system. The assimilative capacity of a plant-soil system for organics is based primarily on the ability to maintain predominantly aerobic conditions for rapid microbial growth and function. Aerobic conditions are not only necessary for stabilization of organic matter (through aerobic microbial metabolism), but also the plant root systems must be sustained under aerobic conditions to ensure adequate growth. Adverse effects on agricultural crops have been detected for soil atmosphere oxygen partial pressures less than 10 percent of total, or approximately 140 ppm (Overcash and Pal, 1979). BOD is generally not the limiting pollutant in land application systems. However, for successful removal of BOD, it is necessary to maintain aerobic conditions in the soil. In addition, aerobic conditions can prevent odor-producing conditions associated with anaerobic decomposition. Surface ponding promotes anaerobic conditions and should be avoided. When ponding occurs, waste application should cease, a drying period should be maintained and surface disking after drying should be implemented to improve infiltration capacity of the soil. Anaerobic conditions also result in increased concentration of soluble iron (Fe^{2+}) in groundwater. The groundwater standard for iron is 0.3 mg/L (WAC 173-200). Thus increased concentration of dissolved iron may result from, and is indicative of, excessive application of high BOD waste that causes anaerobic conditions.

Anaerobic conditions is beneficial if it is followed by a duration of aerobic conditions. Aerobic conditions promote nitrification where ammonia is converted to nitrate. Under anaerobic conditions denitrification will proceed and nitrates will be converted to nitrogen gas. Thus the nitrification-denitrification sequence resulting from aerobic-anaerobic pathways is beneficial for total nitrogen loss. Some of this process does take place, at least in part, during land application of wastewater. Immediately after waste application, anaerobic conditions may prevail followed by aerobic as liquid drains and drying occurs. Also, certain soil aggregates will loose water at a slower rate (and may have prolonged anaerobic conditions) than the average soil. However, soil must be predominantly aerobic for reasons discussed above. Thus, nitrates resulting from aerobic nitrification can potentially leach to the groundwater unless intercepted and utilized by plants. It is important to retain the applied wastewater in the root zone for a duration of time necessary for BOD removal, nitrification and plant uptake. Soil holding capacity and permeability are important factors in determining this retention.

Aerobic conditions may be affected by frequency of land application and drainage characteristics of the soil. For example, when wastewater (which is devoid of oxygen) is applied on land, available oxygen in the soil pore system is rapidly consumed by soil microbes and conditions quickly become anaerobic. For successful treatment, the BOD of the wastewater should be such as not to deplete soil available oxygen. It is important to know the oxygen transfer rates into soil pores at field capacity so that the BOD loading to a given area can be determined. Optimum irrigation frequency must also be determined for maintenance of aerobic conditions in soil.

Field verification of aerobic conditions for a given loading can be conducted by measuring the dissolved iron in the root zone (Faulker et. al., 1989). Reduction of nitrate (during denitrification) can generally proceed before complete removal of oxygen. Manganese closely follows nitrate as it is reduced. The two processes overlap. However, iron will not be reduced in the presence of oxygen since iron-reducing bacteria are obligate anaerobes.

Soil samples can be collected at 6-inch intervals to a depth of 4 feet and analyzed for dissolved iron (Fe^{2+}) using the α, α, -dipyridyl test. A simple on-site test may be performed. Add approximately 5 grams of soil in a 60 mL polypropylene bottle and immediately fill it with 1M sodium acetate solution. Add a few drops of 0.1% α, α, -dipyridyl solution. A reddish-pink color indicates the presence of Fe^{2+}. The intensity of the color is indicative of Fe^{2+} concentration. Samples should not be exposed to sunlight and air for more than 4 minutes. The presence of Fe^{2+} indicates that the soil is hydric and may continue to do so with additional moisture in the soil. A faint pink color my be present even with dry soils especially in presence of high organic matter due to associated Fe^{2+} reduction. Presence of Fe^{2+} indicates that the loading rates should be reduced. Other methods may be used that would measure the soil assimilative capacity for BOD.

Assimilative Capacity of Soil for Nitrogen:

Table 3 contains the concentration of TKN as 207 mg/L. Nitrification in the soil column can potentially convert TKN into nitrates. Groundwater data on nitrogen is available for the drinking water well and reported as 3.6 mg/L for nitrate and 0.82 mg/L for ammonia. However, the drinking water well is a deep well and does not reflect concentrations in the upper aquifer or at the groundwater table.

The groundwater criteria for nitrate is 10 mg/L (WAC 173-200). Enforcement limits are determined on a site-specific basis and are generally established at levels less than the criteria. Enforcement limits are established by considering both AKART and background water quality, which is the protection goal. This is the antidegradation policy contained in WAC 173-200. Monitoring wells must be established hydraulically downstream of land application sites to determine compliance with the groundwater quality standards.

Based on a TKN, NO_3 and NO_2 of 207 mg/L (NO_3 and NO_2 concentrations in the effluent are considered negligible) and a daily wastewater volume of 52,500 gallons, it is estimated that a total nitrogen loading of 90.6 lbs/day is generated at the poultry facility. With a five-day work period each week, and operating 35 weeks per year, the total annual nitrogen production is 15,855 pounds. It is assumed that all the TKN will be eventually converted to nitrate. The grass/legume pasture at the land application site has an annual yield of 4 tons per acre with a nitrogen removal rate of 252 pounds/acre (as per Starkel Poultry's Conservation Report, 2001).

Overcash (1979) indicated that immobilization and denitrification losses of nitrogen, when combined with crop uptake may be estimated as 150 percent of the crop uptake (or 1.5 x 252 = 378). Thus, for agronomic rates of nitrogen application, a total of 50 acres (15,855/378) are required annually. The actual acreage of land required would probably vary depending upon the frequency of irrigation and rotation of parcels of land for irrigation. For agronomic rates of application of wastewater, the crop (grass/legume) must be harvested every year and removed from the site.

The above recommendations do not consider the existing nitrogen concentration of soil and the nitrogen application rate is strictly based on the plant uptake. Consideration should also be given to actual seasonal nitrogen uptake rates as affected by growing and dormant periods. Nitrogen application rates as suggested above should be decreased by an amount that the crops can utilize from the already existing pool of nitrogen in the soil.

It should be noted that only about 50 percent of the applied nitrogen may be available to the plant (Dan Sullivan, person communication with Anise Ahmed, P.E., PhD, December 21, 1994). Applied waste continues to generate plant available nitrogen beyond the first year of application but at a reduced rate. Beyond the sixth year, any applied nitrogen may be considered part of the soil organic matter (humus) and not available for plant uptake.

Microbial assimilation can immobilize part of available nitrogen. The extent of immobilization is less for bacterial flora and greater for actinomycetes. The aerobic microflora that immobilize nitrogen consume between 20 to 25 parts of carbon per unit of nitrogen. Thus, wastewater with C:N ratios greater than 23 would be expected to generate little nitrogen and the organic decomposition is nitrogen limiting. In this instance, net immobilization is occurring. For wastes with a C:N ratio less than 23, decomposition would proceed with adequate nitrogen available for plant usage. This is a net mineralization. From the critical C:N ratio of 23, an approximate ratio of 10:1 is ultimately put into the biological and humus fraction of the soil. The remainder of the carbon is lost as carbon dioxide in microbial growth and the remaining nitrogen is mineralized (Overcash, 1979).

Denitrification or loss of nitrogen from anaerobic reduction of nitrates to nitrogen is minimal and may be neglected for practical purposes. Some denitrification may be present. However, the soil-crop-waste system is predominantly aerobic and dentrification may be assumed negligible.

The agronomic rates of application of nitrogen should be based on the above information. The goal is to reduce any excessive pool of plant-available nitrogen in soil so that long-term potential of nitrates leaching into the groundwater is minimized.

Yearly nitrate-nitrogen soil data collected between August 15, and October 15, can be used as a "report card" on nitrogen management practices. In late summer and early fall, majority of seasonal crop nitrogen uptake has been completed. Nitrate-N remaining in the root zone will largely be leached into the groundwater during winter months. High soil nitrate-N in the late summer/early fall indicates that too much nitrogen has been applied, or that crop management needs improvement.

The Permittee shall develop an Annual Irrigation and Crop Management Plan. This Plan would ensure agronomic rates of nitrogen application and protection of groundwater. As part of this Plan, nitrogen content of the soil as well as that applied as wastewater would be monitored and evaluated annually to determine the rate and amount of application to be used in the following year.

Total Dissolved Solids (TDS):

TDS criteria for groundwater quality is 500 mg/L. Table 2 provides the data summary collected from the piezometers. The data shows that TDS is currently being met and is not high priority concern at this time. The Permittee should continue to routinely monitor for TDS as specified in this permit.

Chlorides:

TDS criteria for groundwater quality is 250 mg/L. Table 2 provides the data summary collected from the piezometers. The data shows that chlorides is currently being met and is not high priority concern at this time. The Permittee should continue to routinely monitor for chlorides as specified in this permit.

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are specified to verify that the treatment process is functioning correctly, that ground water criteria are not violated, and that effluent limitations are being achieved (WAC 173-216-110).

WASTEWATER MONITORING

The monitoring schedule is detailed in the proposed permit under Condition S2. Wastewater monitoring is necessary to determine the quality of wastewater being applied to land. Monitoring of wastewater will be required for flow, nitrate/nitrite-N, ammonia-N, TKN, BOD_5, TSS, TDS, FOG, chloride, and total coliforms.

CROP MONITORING

At harvest the crop should be monitored for yield (pounds or tons per acre), moisture content, nitrate-N and TKN content. Crops harvested must be removed from the land application site so that nitrogen in the crop is not returned back into the soil. The Permittee may conduct additional crop monitoring (such as WSUs monthly crop monitoring program) but must at all times conduct the minimum required monitoring per Special Condition S2.D.

SOIL MONITORING

Monitoring of soil should be done for nitrogen species, infiltration capacity and pH. This will facilitate in applying wastewater at agronomic rates by determining how much nitrogen is available in the soil system for plant uptake and calculating how much additional nitrogen should be applied based on plant needs.

Information on infiltration capacity of soil and crop water needs can be used to determine the optimum hydraulic loading that would provide the required water and nitrogen to the crops without causing flooding or leaching of nitrates, or causing odors.

GROUND WATER MONITORING

The monitoring of ground water at the site is required in accordance with the Ground Water Quality Standards, Chapter 173-200 WAC. The Department has determined that this discharge has a potential to pollute the ground water. Therefore the Permittee is required to evaluate the impacts on ground water quality. Monitoring of the ground water at the site boundaries and within the site is an integral component of such an evaluation.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3 are based on the authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-216-110).

IRRIGATION AND CROP MANAGEMENT PLANS

The irrigation and crop management plan is required to support the operations and maintenance manual and the groundwater sampling and analysis plan. The irrigation and crop management plan shall include a consideration of wastewater application at agronomic rates and should describe and evaluate various irrigation controls.

OPERATIONS AND MAINTENANCE

The proposed permit contains Condition S4 as authorized under Chapter 173-240-150 WAC and Chapter 173-216-110 WAC. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment. The permit requires submission of an updated O&M manual for the entire wastewater system at least once per permit cycle.

SOLID WASTE PLAN

The Department has determined that the Permittee has a potential to cause pollution of the waters of the state from leachate of solid waste.

This proposed permit requires, under the authority of RCW 90.48.080, that the Permittee review and update the solid waste plan (if necessary) and submit it at least once to the Department during this permit cycle. The Plan should address the prevention of solid waste from polluting the waters of the state.

SPILL PLAN

The Department has determined that the Permittee stores a quantity of chemicals that have the potential to cause water pollution if accidentally released. The Department has the authority to require the Permittee to develop best management plans to prevent this accidental release under section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080.

The Permittee has developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the Permittee to review and update this plan (if necessary) and submit it at least once to the Department during this permit cycle.

GENERAL CONDITIONS

General Conditions are based directly on state laws and regulations and have been standardized for all industrial waste discharge to ground water permits issued by the Department.

Condition G1 requires responsible officials or their designated representatives to sign submittals to the Department. Condition G2 requires the Permittee to allow the Department to access the treatment system, production facility, and records related to the permit. Condition G3 specifies conditions for modifying, suspending or terminating the permit. Condition G4 requires the Permittee to apply to the Department prior to increasing or varying the discharge from the levels stated in the permit application. Condition G5 requires the Permittee to construct, modify, and operate the permitted facility in accordance with approved engineering documents. Condition G6 prohibits the Permittee from using the permit as a basis for violating any laws, statutes or regulations. Conditions G7 and G8 relate to permit renewal and transfer. Condition G9 requires the payment of permit fees. Condition G10 describes the penalties for violating permit conditions.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, and to protect human health and the beneficial uses of waters of the State of Washington. The Department proposes that this proposed permit expire on June 30, 2009. This is for a period of less than five years but conforms to the Department's goal of managing permits in each water quality management area on a five-year cycle.

REFERENCES FOR TEXT AND APPENDICES

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Overcash, M.R., Pal, D. Design of Land Treatment Systems for Industrial Wastes – Theory and Practice. Publisher: Ann Arbor Science. 1979.

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Starkel, M. Solid Waste Control Plan Statement in Letter. December 11, 1997.

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Starkel, M. Operation Manual for Starkel Poultry, Inc. Waste Water Disposal System [in letter format]. February 12, 1997.

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Washington State Department of Ecology. Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems. Ecology Publication # 93-36. 1993.

Washington State Department of Ecology. Implementation Guidance for the Ground Water Quality Standards. Ecology Publication # 96-02. 1996.

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Washington State University. Laboratory Procedures - Soil Testing Laboratory. 38 pp. November, 1981.

Washington State University. Post-Harvest Soil Nitrate Testing for Manured Cropping Systems West of the Cascades. Publication Number EM 8832-E. 16 pp. May 2003.

APPENDICES

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations, which are described in the rest of this fact sheet.

Public notice of application was published on July 13, 2003, and July 20, 200,3 in the *News Tribune* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on January 17, 2005, in the *News Tribune* to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Industrial Unit Permit Coordinator
Department of Ecology
Southwest Region - Water Quality
P.O. Box 47775
Olympia, WA 98504-7775

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the 30-day comment period to the address above. The request for a hearing shall indicate the interest of the party and reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-216-100). Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing.

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within 30 days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, (360) 407-6280 or by writing to the address listed above.

This permit was written by John Diamant, P.E.

APPENDIX B--GLOSSARY

Ambient Water Quality -- The existing environmental condition of the water in a receiving water body.

Ammonia (NH_3) -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation -- The average of the measured values obtained over a calendar month's time.

Best Management Practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5 -- Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of the collection or treatment facility.

Compliance Inspection - Without Sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling -- A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits. Additional sampling may be conducted.

Composite Sample –- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Construction Activity -- Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –- Uninterrupted, unless otherwise noted in the permit.

Distribution Uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Engineering Report -- A document, signed by a professional licensed engineer, which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fats, Oils and Greases (FOG) – FOG analysis provides a measured value of the amount of fats, oils and greases that is in the water.

Grab Sample -- A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial Wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Maximum Daily Discharge Limitation -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL) -- The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Nitrate/Nitrite (NO3/NO2) – Nitrate is the product of aerobic transformation of ammonia and is the most common form of nitrogen used by aquatic plants. Nitrite is usually not present in significant amounts in aerobic environments.

pH -- The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL) -- A calculated value five times the MDL (method detection level).

Soil Scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

State Waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit -- A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Coliform Bacteria -- A microbiological test which detects and enumerates the total coliform group of bacteria in water samples.

Total Dissolved Solids (TDS) -- That portion of total solids in water or wastewater that passes through a specific filter.

Total Kjeldahl Nitrogen (TKN) – TKN is the measure of organic nitrogen and ammonia in water.

Total Suspended Solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Water Quality-based Effluent Limit -- A limit on the concentration of an effluent parameter that is intended to prevent pollution of the receiving water.

APPENDIX C--RESPONSE TO COMMENTS

Verbal comments were received from Starkel Poultry on January 24, 2005, and were incorporated into the permit and fact sheet. All comments were regarding factual errors or typographical errors.